**Guidelines for the Prevention of Coronavirus Pneumonia in Elderly People**

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Abstract:

Elderly people have weakened immune functions and suffered from many chronic underlying diseases. They are a high-risk population infected with COVID-19. Most patients who have died of COVID-19 were either elderly patients or patients with underlying diseases. Therefore, it is important to improve the knowledge and awareness of the prevention of COVID-19 among the elderly. In this guideline, we analyzed the causes of the susceptibility of the elderly and the susceptibility to critical illness. Based on the characteristics of the prevention and control of COVID-19 among elderly people, we have proposed the following recommendations from three perspectives: infection source, transmission route, and susceptible population. These preventions can help reduce the infection of the elderly with COVID-19.

Keywords: Elderly people, COVID-19, Prevention, SARS-CoV-2

1. Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a positive-sense single-stranded virus with viral envelopes covering its outer layer. It was named coronavirus owing to its petal- or club-shaped surface projections that are arranged radially on the viral envelopes, making it look like a crown. The pathogens of the severe acute respiratory syndrome (SARS) outbreak in 2003 and the Middle East respiratory syndrome (MERS) outbreak in 2012 were both coronaviruses. Coronavirus pneumonia is a viral pneumonia associated with the coronavirus disease (COVID-19), which is a new strain that has never been found in the human body before. Up until now, we have not fully understood its source, characteristics, host, transmission route, pathogenic toxicity factor, etc.

The development of science and technology in fields such as medicine has witnessed a continuous improvement in global living standards and more comprehensive social welfare systems in individual countries, which have in turn prolonged the average life expectancy of human beings. Together with a decline in birth and death rates, these factors have contributed to a gradually increasing proportion of the population living much longer. China has already become an aging society. In China, people over the age of 60 years are defined as elderly. According to data from the National Bureau of Statistics, as of January 2019, there were 240 million people in China who were 60 years and older, and who accounted for 17.9% of the total population. From a clinical perspective, elderly patients often demonstrate different characteristics than young and middle-aged patients; this difference is now drawing more and more attention. Elderly patients have compromised immune functions; additionally, they often suffer from chronic underlying conditions, making this age group susceptible to infectious diseases. Whilst the overall population is generally susceptible to COVID-19, the disease leaves elderly patients in a more critical condition after infection. Most patients who have died of COVID-19 were either elderly patients or patients with underlying diseases. Therefore, it is important to improve the knowledge and awareness of the prevention of COVID-19 among the elderly.

A summary of the current understanding of COVID-19 is listed in Table 1 [1].

Table 1 Clinical characteristics of COVID-19

|  |  |
| --- | --- |
| Pathogenic characteristics | * β-coronavirus.
* Host remains unidentified. Existing research indicates that its homology with bat SARS-like coronavirus is above 85%.
* Sensitive to ultraviolet light and heat. It can be inactivated by heating at 56 °C for 30 minutes, ether, 75% ethanol, chlorine-containing disinfectant, peracetic acid, and lipid solvents such as chloroform. However, chlorhexidine cannot inactivate the virus.
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| Infection source | Patients infected with SARS-CoV-2, although asymptomatic virus carriers can also be the infection source.  |
| Transmission route | Primary transmission routes include respiratory droplet transmission and contact transmission. The possibility of aerosol and digestive tract transmissions are yet to be confirmed. |
| Susceptible population | General population. |
| Incubation period | Generally, 1–14 days. Most patients develop symptoms within 3–7 days. |
| Clinical manifestations | * Fever, fatigue, and dry cough are major manifestations. Some patients may also develop symptoms such as nasal congestion, runny nose, sore throat, and diarrhea.
* Severe cases often develop dyspnea and/or hypoxemia one week after disease onset. In critical cases, the disease may rapidly progress to acute respiratory distress syndrome, septic shock, metabolic acidosis that is difficult to treat, and coagulopathy.
* Mild cases only demonstrate symptoms such as low fever, minor fatigue, etc., and no pneumonia symptoms.
* The majority of patients have a good prognosis, and children often demonstrate relatively mild symptoms. Few patients will progress to critical conditions. However, elderly patients and those with chronic underlying diseases have a poor prognosis.
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| Laboratory examinations | * During the early stage of disease onset, the total number of peripheral white blood cells is normal or reduced, and the lymphocyte count decreases. Some patients may have increased levels of liver enzymes, lactate dehydrogenase (LDH), muscle enzymes, and myoglobin. Some critically ill patients can also experience increased levels of troponin.
* In most patients, C-reactive protein (CRP) and the erythrocyte sedimentation rate increase, and procalcitonin stays normal. In critical cases, D-dimer increases, and the number of peripheral blood lymphocytes progressively declines.
* The nucleic acid of SARS-CoV-2 can be detected in pharyngeal swabs, sputum, lower respiratory tract secretions, blood, feces, etc.
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| Imaging | During early onset, images show multiple small patchy shadows and interstitial changes, which are more obvious in the peripheral lung. As the disease progresses, images show multiple ground-glass shadows and infiltration shadows in both lungs. In critical cases, lung consolidation can be observed, although pleural effusion is rare. |
| Treatment | As there are currently no specific antiviral drugs, symptomatic treatment is the primary treatment method. |

1. Reasons for the susceptibility of the elderly to infection and critical illness

The National Health Commission reported that as of 12.00 a.m., January 22, 2020, of the 425 patients diagnosed with COVID-19, 162 were elderly patients aged over 65 years, with the latter accounting for 38.1% of all diagnosed patients [2]. In addition, the average age of the first 17 patients who died of COVID-19 was 75 years (48–89 years). Among the 17 patients, 15 were aged over 60 years, whilst the youngest was 48 years old. Compared with patients aged under 70 years, those aged 70 years or above often have a shorter survival period (11.5 vs. 20 days). Additionally, most of the current deaths are associated with underlying diseases such as hypertension and diabetes [3]. These results indicate that middle-aged and elderly patients are the most susceptible to COVID-19. In addition, patients who have become critically ill are mainly elderly patients with underlying diseases.

Elderly people experience a degeneration in physiological functions as they grow older. For example, respiratory functions diminish, and functions of the immune system decline substantially. This functional degeneration is manifested in a decreased number of immune cells and weakened activities, making elderly people a susceptible population to infectious diseases. In addition, some elderly people suffer from various underlying diseases, such as diabetes, coronary heart disease, hypertension, and chronic lung disease. Therefore, the elderly population is more susceptible to COVID-19 and can become severely or critically ill during infection.

COVID-19 has a concealed onset, a long incubation period, and diverse and atypical initial symptoms. Its primary symptom is fever, which can be coupled with a mild dry cough, fatigue, breathlessness, diarrhea, etc., whilst other symptoms include a runny nose and sputum but are not as common. However, some COVID-19 patients may not experience a fever or cough, but instead present clinical symptoms such as fatigue, chest tightness, and gastrointestinal symptoms. Symptoms in elderly people can be atypical. For example, some elderly patients may develop delirium and conscious disturbance during the onset or the early stage of the disease. These atypical initial symptoms made early detection, diagnosis, and intervention difficult among the first patients, thereby elevating the mortality rate of the age group. Furthermore, in the current era where the Internet is the main source of information, the elderly population may not always acquire timely and sufficient information updates when compared with young and middle-aged populations. Therefore, they often lack awareness and attention to the prevention and protection against COVID-19, which increases risks of infection and disease transmission. Consequently, it is necessary to strengthen the knowledge and awareness of the prevention of COVID-19 among elderly people.

1. Guidelines for the prevention of COVID-19 among elderly people

Based on the characteristics of the prevention and control of COVID-19 among elderly people (Table 2), we have proposed the following recommendations from three perspectives: infection source, transmission route, and susceptible population.

Table 2 Guidelines for the prevention of COVID-19 among different age groups

|  |  |  |
| --- | --- | --- |
|  | Young and middle-aged population | Elderly population |
| Knowledge of disease prevention | Knowledge comes from multiple sources and is frequently updated | Due to insufficient knowledge source, this population often lacks knowledge and awareness of the prevention of COVID-19 |
| Prevention initiatives | Flexible and active | Often relies on others |
| Immunity | Normal | Decreased |
| Combined chronic underlying diseases | Less | More |
| Clinical manifestations | More typical, easy to detect | Less typical and more concealed, easy to ignore  |
| Critical cases | Less common | More common |

* 1. Avoid contact with the infection source

Multiple animal species, including humans, can be infected with SARS-CoV-2. Although the natural host of the virus has still not been identified, some evidence suggests that the Chinese rufous horseshoe bat (*Rhinolophus sinicus*) may be the natural host of the virus, whilst other wild animals may also participate in the transmission. Therefore, the following precautions are advised: do not eat wild animals, wash hands after touching poultry and livestock, do not come in direct contact with sick animals and poultry, do not process and eat dead poultry and livestock, or poultry and livestock meat that has not been quarantined, and do not eat raw or undercooked poultry and livestock meat. Since elderly people’s diets and activities of daily life are often assisted by caregivers or helpers, they should also be included in the prevention against COVID-19.

COVID-19 patients and carriers of COVID-19 are the primary spreaders of the disease. Therefore, an effective method of stopping the transmission of COVID-19 is to cure or isolate these patients and carriers. Due to a weakened body response, elderly people often demonstrate an underlying onset as well as atypical clinical symptoms. Consequently, it is necessary to closely monitor elderly people with histories of disease exposure, and more comprehensive screening should be performed if necessary. As the incubation period of COVID-19 can be as a long as 14 days, potential carriers should be closely monitored for 14 days to facilitate the identification of virus carriers.

* 1. Cut off the transmission route

The SARS-CoV-2 virus is highly pathogenic and contagious. Its transmission routes include: airborne droplet transmission, contact transmission, and potential fecal-oral transmission.

As the primary transmission route of SARS-CoV-2, airborne droplet transmission can happen between face-to-face conversations, sneezing, and coughing in daily life. The most effective method of reducing airborne droplet transmission is to wear masks correctly; in addition, avoiding spitting everywhere, and covering up the nose and mouth while sneezing can also effectively decrease the chance of droplet transmission. Due to their reduced ability of sputum excretion, elderly people sometimes need assistance in discharging sputum. During this process, procedures for auxiliary sputum discharge should be strictly followed, so as to protect both the operator and the patient, and reduce the risk of infection. The SARS-CoV-2 virus can survive in air for a short period of time and form particles that can spread through the air and infect other people through long-distance transmission. Therefore, keeping the environment ventilated, avoiding crowded places, and adhering to self-isolation are all effective ways to reduce the chance of airborne transmission. During ventilation, care should be taken to avoid excessive temperature changes.

The SARS-CoV-2 virus can also spread through contact transmission via skin and conjunctiva. In order to reduce contact transmission, it is recommended to wash hands frequently, maintain good hand hygiene, regularly perform indoor cleaning, keep the environment clean and tidy, reduce indoor environmental pollution, and promptly remove household garbage and waste. In addition, disinfecting frequently touched items with alcohol can effectively inactivate the virus.

Recent tests have suggested that SARS-CoV-2 can be isolated in patients’ feces. As the possibility of fecal-oral transmission cannot be eliminated, it is important to maintain good personal hygiene and prevent the disease from entering the body via the mouth. After using the toilet, the bowl should be covered with the lid before flushing to prevent the aerosol from spreading into the air.

Elderly people are physically weak and have poor adaptability to the environment. In particular, as they cannot adapt to environmental temperature changes, they are susceptible to cold-induced respiratory infectious diseases. In addition, due to their poor self-care ability, elderly people inevitably need escorts and therefore cannot realize absolute self-isolation. In order to cut off the transmission route of COVID-19 among the elderly, it is essential to ensure the health of the escort as well.

* 1. Protect the susceptible population

Based on the characteristics of elderly people, the following recommendations are proposed to reduce the incidence of COVID-19.

1. Reasonable diet

Malnutrition is one of the main negative factors affecting disease outcome in elderly patients [4]. Therefore, it is recommended that elderly people should maintain a balanced diet, control their body mass index (BMI) within the 19–24 kg/m2 range, have a balanced intake of calories, protein, vitamins, minerals, etc., and have more meals a day but less food at a time. In addition, it is suggested that they eat foods that are easy to digest or facilitate digestion, increase their consumption of vegetables and fruit, drink water frequently, and consume high-protein foods such as fish, meat, eggs, milk, beans, and nuts in reasonable quantities on a daily basis. Meanwhile, elderly people should strictly avoid eating wild animals, rotten and expired food, and semi-cooked and raw food. It is important to ensure rich and diverse food types and sources, and maintain a balanced diet composed of both meat and vegetables, so that adequate nutrition is supplied to the body. For elderly people with dysphagia, nasal feeding can be performed according to the dietician’s recommendation, whilst parenteral nutrition support can be administered if necessary. For all elderly people, accidental inhalation during eating should be prevented, as it can cause aspiration pneumonia.

1. Good living habits

Elderly people should ensure that they get adequate sleep every day and keep warm during sleep. In addition, it is important to select an appropriate method of exercising, understand personal limits, exercise moderately, and maintain a healthy life style, thereby improving resistance to infection. The elderly should also avoid going outside, especially crowded places such as senior activity centers and senior universities. In addition, windows should be opened frequently to keep the room well ventilated, disinfect the room regularly, do not spit everywhere, maintain good hand hygiene, actively monitor personal health, and measure body temperature if experiencing a fever. Elderly people who are bedridden and have limited physical mobility should undergo limb rehabilitation, and their bodies should be turned over regularly when in bed to prevent deep vein thrombosis and bedsores.

1. Healthy mental state

Psychological crisis intervention should be incorporated into the deployment of epidemic prevention and control to reduce possible psychological trauma that can be caused by the disease [5]. After retirement, the activity range of elderly people decreases, and their focus on activity also changes. Together with changes in their physiological characteristics such as sensation, exercise, and cognition, elderly people experience changes in psychological characteristics, which is demonstrated by a reduced sense of security and less adaptability. As a result, they tend to develop feelings of loss, inferiority, and emptiness, etc. Upon disease onset, elderly people can exhibit higher levels of anxiety and depression as well as have difficulty in cooperating with treatment. Therefore, it is important to provide the elderly population with targeted medical and entertainment services, regular care in their living environment, encourage them to demonstrate their talents and hobbies, and encourage them to actively adapt to a new lifestyle. By implementing these methods, elderly people can maintain contact with their families and society, and their anxiety and depression can be alleviated so that they can maintain a healthy mental state and actively cooperate with the treatment.

1. Active treatment of underlying diseases

Elderly patients often suffer from chronic underlying diseases such as hypertension, diabetes, and coronary heart disease, making them a susceptible population for infection and critical illness during the COVID-19 pandemic. Therefore, it is important that these patients follow doctors’ instructions and administer drugs timely, regularly, and properly based on the specific underlying disease. At the same time, secondary prevention and treatment of related diseases should be carefully administered. In addition, these patients should learn to evaluate their symptoms, monitor their general condition, and promptly seek medical advice when there is a change in their condition, appropriately describe their condition during a consultation, and avoid turning to the incorrect doctor, or concealing their sickness. For elderly patients with limited activity and impaired cognition, family members should assist the treatment and properly evaluate and monitor the patient.

1. Conclusion

With increasing social aging, health problems of elderly people are getting more and more attention. Elderly people have poor resistance and often suffer from other underlying diseases. Therefore, during the COVID-19 outbreak, the elderly population presents general susceptibility, high prevalence, fast disease progression, and high mortality. This makes them a key target for epidemic prevention. Unlike younger adults, elderly people have reduced body function, declined resistance, and limited self-care ability. Therefore, based on guidelines for the prevention of COVID-19 among adults, we propose prevention recommendations tailored for the elderly population in this study. The proposed recommendations ensure that epidemic prevention measures protect not only elderly patients, but also their escorts, and that comprehensive, precise, and focused care are provided to these patients, so as to achieve a victory against COVID-19 as early as possible.

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